ABSTRACT

Injection Moulding (IM) is considered to be one of the most prominent processes for mass production of plastic products. One of the biggest challenges, facing injection molders today, is to determine the proper settings for the IM process variables. Selecting the proper settings for an IM process is crucial because the behavior of the polymeric material during shaping is highly influenced by the process variables. Consequently, the process variables govern the quality of the parts produced. The difficulty of optimizing an IM process is that the performance measures usually show conflicting behavior. Therefore, a compromise must be found between all of the performance measures of interest.

This thesis demonstrates a method of achieving six sigma standards in small and medium plastic injection moulding enterprises. A modified six sigma cycle called DAURR (Diagnose, Analyze, Upgrade, Regulate and Review) based on Taguchi method, Regression analysis and Artificial Neural Network has been proposed in this work that can be used to find the best compromises between performance measures in IM, and potentially other polymer processes. Its feasibility was studied with the help of a case study. The method has been employed for the improvement in two quality characteristics (hardness and over shrinkage) of injection-molded nylon-6 kamani bush produced in a small enterprise. After the implementation of the proposed method, targets for improvement are clearly defined with the problems and causes being identified. The process parameters are then optimized for quality characteristics improvements so that the Six Sigma standard is reached. This research work
provides methodology so that six sigma approaches can be applied and adjusted according to the requirements of small and medium enterprises (SMEs). This work also presents a novel, general and intelligent approach to multi response process optimization, with a purpose to obtain a single optimum setting of process parameters that meets specifications of all considered, possibly correlated, responses.